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ON A MICROSCOPICAL SLIDE-CATALOGUE.

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The system of cataloguing histological and other microscopical preparations here shown is primarily intended as a substitute for the card-catalogue, for the use of that very large and important class of workers who do not, need not, and will not, undertake the labor of maintaining the more cumbersome and troublesome system by cards; but it is also believed to be available in connection with cards for those who may find it necessary to employ also the latter.

There is a great deal of useful work done with the microscope, and more that ought to be useful, along the various lines of investigation among plants and animals, by students who use the microscope so little and so incidentally, that they attach slight importance to the work, and make no formal effort to preserve it either in mounts or in manuscript. But from time to time, they casually lay aside a slide which contains some important object, or illustrates some special point which is likely to be required for future use. The exact character and history of each slide, and the various points for which it is valued, are so fresh in the mind, that they are assumed to be a part of the possessor's permanent resources, and no question is raised about them. But as years pass by, the few dozens of slides become hundreds and then thousands, the recollections of them become distant and dim, and crowded by more recent thoughts, the precise peculiarities of preparation, or the characteristics for which they were wanted are forgotten, and are necessarily

very imperfectly represented upon the labels. A written sheet or card descriptive of each slide might have been carefully prepared and laid aside where it could be found when wanted, but it wasn't, and probably wouldn't have been had the resolution to do so been formed ever so many times; and the owner at last begins to realize that his collection was both made and marred before he became aware that he was forming one at all. A suitable history of his cabinet would be invaluable, or at least measured only by the possible value of the collection itself; for without it most of the slides are little better than rubbish, and considerable trouble might have been saved by throwing them away to begin with. The point cannot be too well remembered that any slide which is worth preserving at all, for any scientific purpose, is worthy of a proper registry at the time of acquiring it; not by merely numbering it and entering its name in one line of a book, the line afterwards growing to two or three as crowding ensues and experience shows more space to be necessary, but by cataloguing in a descriptive manner according to some sensible and thoroughly systematic plan which is likely to be permanently satisfactory. When, if ever, the beginner becomes a specialist, with trained assistants, and the resources of a laboratory with its card-catalogue at command, then such a register may still continue useful as a serial list and for the temporary preservation of data concerning objects in course of preparation.

If there were only two or three things to be recorded of a slide, they might be written in a fixed order by mere force of habit without further formality, like a library catalogue-card. But the really valuable data concerning a prepared slide are too numerous to be easily selected and arranged by memory alone, the desired thoroughness and uniformity of description requiring some artificial assistance. By far the simplest and best method would be to tabulate the data in columns down a page, but the items are too numerous to admit of this arrangement on a page of available size, and

much convenience would be lost by sub-dividing, so that all could not be seen at once. But by giving three or four lines to each entry, conspicuously mapped out by red lines, and entering a like number of related items in each column, the desired end can be easily and fully attained. By adopting the ordinary quarto size of page, assigning ten numbers to each page (the decimal arrangement being most convenient for rapid reference), and carrying the entries across each pair of facing pages as seen when the book is opened, an area about equal to that of a postal card can be assigned to each object, this being an adequate amount for most purposes of record, and the most that can be secured without sacrifice of convenience as a catalogue. Of course numerous contractions for familiar names of apparatus, processes, etc., will inevitably be used to prevent crowding; and occasional long historical or critical notes, or frequently recurring formulæ will be entered in an appendix of separate blank leaves, and referred to by number.

The items most commonly desired are tabulated in print at the head of each page, and only referred to by suggestive letters below; so that the description of each slide appears as a practically uninterrupted block of manuscript, easy to read and available for substitution of other data according to individual necessities. The printed letters down the page become so familiar after a few minutes' use as to be scarcely thought of afterwards, they serving merely as hints to indicate where to enter certain data in a blank page, or where to look for them in a filled one. Certain items are entered during the preparation of a slide, or when it is laid aside in the cabinet, and others, especially cross-references to various points of structure, or references to books or journals, may be suggested and entered from time to time, as the slide is used or the literature of the subject studied; so that, with scarcely appreciable labor, the educational value of one's cabinet is constantly enhanced.

As arranged by the writer, and shown in the accompany-

ing plate, the data are grouped in four columns, the first giving the common and scientific *names* of the object and its source, and the second its *habitat* or locality, collector, etc. Beneath these is room for a long entry as to *special points* shown, references, criticisms, or other notes not classified elsewhere. The third column gives the *preparation* of the object, how preserved, hardened, softened, injected, etc., how manipulated or dissociated, cut, teased, etc.; and the staining and clearing media, if any. This column, as lettered, is almost equally suited to histological or pathological work, either vegetable or animal; but by introducing obvious substitutions it may be made available for slides in lithology, micro-chemistry, etc., and thus the catalogue becomes available for a mixed general collection. The fourth column gives details of *mounting*, the medium, cell and cements, cover-glass, date, location in cabinet, repairs, etc.

The thickness of cover-glass should always be entered if exceptionally thick or thin, for obvious reasons; and in any case it should be entered if measured, to obviate the possible necessity for measuring it again, whether in reference to the selection of a suitable objective, or for the approximate adjustment of the screw-collar, or for saving time, when examining many preparations, by taking those in succession which will require little, if any, change of adjustment. Whether measured by the special instruments sold for the purpose, or by the microscope micrometer, the cover being held edgewise in the stage forceps, or in a notched cork supported upon the stage (the most accurate but most troublesome way), or, after mounting, by focussing with the fine adjustment wheel, first upon the upper and then upon the lower surface of the cover, or on the top of the object in some balsam mounts, and recording the difference between the two readings, it should of course be done always in exactly the same manner. The latter method (with or without an estimated correction for refraction, so as to give the real

instead of the apparent thickness of the glass) is sufficiently accurate and is perhaps the best way, as it can be done equally well at any time and is the only method by which neglect at the moment of mounting can be satisfactorily corrected at convenience thereafter. For slides used frequently in teaching, it often saves time to record also the approximate cover-adjustment of the lenses with which they are commonly employed, the final correction being given, of course, at the moment when required.

The location in cabinet must be specified in large classified collections, to save time in finding slides whose character might allow them to be placed equally well in any one of the four or five different places. In some large collections these unavoidable complications have led to the abandonment of a natural classification and the arrangement according to the serial numbers, each drawer being devoted to a certain regular succession of numbers; by which means any slide can be promptly found when wanted, but the great convenience of having similar objects (as diatoms, algæ, or seeds) grouped together for comparison and selection is lost. By this system of cataloguing, however, the slides may be classified in any way most convenient to the owner and still be found as readily as in the awkward serial arrangement.

The Alphabetical Index is, of course, a large and an essential portion of this system. Its pages are specially ruled for convenience in entering titles and numbers, and they have a capacity for several references to each slide. The volume for 2,000 slides has room for nearly 10,000 references, or about five for each slide. Thus a leaf preparation may not unlikely be referred to under both popular and scientific names of the plant and also under several such titles as " Leaf of —", " Spiral Vessels in —", " Stomates of —", " Hairs of —", " Starch in —", " Raphides in —", etc. But as many simple slides require only two or three entries, the more complex ones will have space for eight or ten.

The Index is lettered alphabetically, the number of pages assigned to each letter depending upon the frequency with which that letter occurs at the beginning of English words. Subdivision is accomplished according to the vowel system of arrangement, whose advantages are familiar to all readers, and which may, by means of a few obvious expedients, be made applicable to slide-catalogues of various sizes. Thus the pages devoted to any letter, as **s**, are divided into six portions and lettered **sa, se, si, so, su, sy**; the first portion being for words beginning with **s** and having **a** for their first vowel, and so on for the rest. Further subdivision is not specified in the forms, because it depends so largely upon individual wants as to be best left optional with the user. But having given a page to the **sa** words, for instance, it is difficult to believe that any thoughtful person could possibly throw all these together at random. Probably nearly every one would enter things pertaining to animals at the top of the page, vegetables in the middle and minerals at the bottom, or *vice versa*. A specialist in any department would give the lion's share of the page to his particular province, subdivided to suit himself; and the vegetable kingdom, being in the middle, could be carried up or down, where experience showed, as the page gradually filled, that room could best be spared. After such entries as starch, pollen, hair, etc., several lines would be left blank for similar items, so that ultimately these items would appear in blocks that would be instantly recognized on glancing at a page. In larger collections where **sa** included many pages, a number of these whole pages would be assigned to animal, vegetable and mineral objects respectively. In this case a botanist, for instance, would probably reserve more pages for plants than for all the rest; and he might at first devote a column or even a whole page for such a group as starches, and a like portion of **se** for seeds, one column of the seed page being given to whole seeds and another to sections, etc. Subsequently, if too much space proved to have been reserved,

the lower portions of the vacant parts would be filled with other things. By such expedients, a rough but most useful working classification of the pages and of their contents can be maintained until the book is nearly full.

The accompanying sample page (*page 240*) of **sa** entries of familiar objects, though much more crowded and therefore less satisfactory than in actual use, shows how such a plan is carried out, and with what facility any object may be found in a collection of 3,000 or 4,000 slides.

Obviously the catch word by which an entry will be found is its first word, by which it was located and sought for ; and the other most characteristic word, which distinguishes the item from others of its kind, and which may or may not be the only other word, may be underlined for easy recognition. The writer uses pencils of different colors for this purpose, in the serial list as well as in the index, red for animal, green for vegetable and blue for mineral specimens, and thus gains a perspicuity whose value is evident. By a little extra care in labeling the slides, the same distinction of colors may be extended to the labels, using red, green and blue tinted papers, or white paper with borders printed in those colors, as a means for readily recognizing and distributing the slides themselves whenever they have become mixed in use.

Though not admitting the absolutely alphabetical sequence attained by cards, this system is in some respects even more practical than that for small collections, say up to three or four thousand slides. It is easier to see and compare numerous items when collated upon a page than when stacked away in cards. Thus fifty or sixty entries of hairs or of crystals can be reviewed and compared, and a half-dozen selected for some purpose, much better by glancing over a page than by leafing over that number of separate cards ; while the graphic effect of the page is of perceptible use in keeping one's mind constantly familiar with the extent and character of his collection. The cards are theoretically

better, and in very large collections practically better for finding any specified slide that one knows he wants ; but are not better, nor even as good, for assisting him to decide what he wants from among many.

In this catalogue, pages for from 1000 (the smallest number really worth starting with) to 3000 objects, with an adequate appendix of blank pages, and an alphabetical index as described above, can be readily bound in a volume of convenient size. For larger collections of any required limit, they may be bound in more than one volume. The serial list may be divided without disadvantage, say 4000 or 5000 to a volume, but the appendix and index should then be bound in a volume by themselves or separately, if too large for combination. In very large sets, the animal, vegetable, and mineral kingdoms may be indexed in separate volumes.

This system of building up a useful descriptive catalogue at a merely nominal expenditure of labor is the outgrowth of the writer's experience, during some thirty years past, in trying to make a constantly increasing collection of slides as useful as possible, as objects of reference in teaching as well as in study, and with the least possible cost of time and labor. Its details are easily varied for adaptation to special wants or changing manners. It has been of service to many of the writer's friends as well as himself; and it is offered in the hope that, directly or indirectly, it may be of service to others working in the same field.

WARD'S SLIDE-CATALOGUE.

OBJECT.		(Left-hand Page.)		SOURCE.	
Slide No.	c.	Common Name.		h. Habitat or Locality.	
	s.	Scientific Name.		c. Collector (Presented, Purchased, Exchanged, etc.)	
	N.	General Character or History of Object. Special points shown, Illumination or powers required, Reference to Authorities, etc.			
50	c	h			
	s	c			
	N				
51	c	h			
	s	c			
	N				
PREPARATION.		(Right-hand Page.)		MOUNTING.	
p.	Preserved (Hardened, Macerated, Decalcified, Injected, etc.)		m.		Mounting Medium.
	Cut (Embedded, Frozen, Microtome), Teased, etc.		cc.		Cell and Cement.
	Stained.		cg.		Cover-glass Thickness.
	Cleared.		r.		Repairs or Disposal (Broken, Cement run in, Air in, Given to or Exchanged with, etc).
50	p	m			
	ct	cc			
	st	cg		dlc	
	cl	r			
51	p	m			
	ct	cc			
	st	cg		dlc	
	cl	r			